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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
KHOSRAVIANI, ARMAN	

ART UNIT	PAPER NUMBER
2809	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)
	10/582,390	CRAVEN ET AL.
	Examiner	Art Unit
	Arman Khosraviani	2809

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *09 June 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-11* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-11* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *09 June 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *See Continuation Sheet*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Continuation of Attachment(s) 3). Information Disclosure Statement(s) (PTO/SB/08), Paper No(s)/Mail Date :07/06, 10/06, 12/06, 05/07, 07,07, 08/07.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

> The factual inquiries set forth in **Graham v. John Deere Co., 383 U.S. 1, 148 USPQ 459 (1966)**, that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows: ***(See MPEP Ch. 2141)***
>
> a. Determining the scope and contents of the prior art;
> b. Ascertaining the differences between the prior art and the claims in issue;
> c. Resolving the level of ordinary skill in the pertinent art; and
> d. Evaluating evidence of secondary considerations for indicating obviousness or nonobviousness.

> This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

2. Claims 1-3, 5-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dwilinski et al. (US 2006/0138431) in view of Alfano et al. US 2004/0135222).

Regarding claim 1, Dwilinski teach the method for forming a nitride semiconductor device, comprising: (a) growing one or more gallium nitride (GaN) layers

on a substrate (claim 10, pg. 5/pp. 0059, pg. 10/pps. 0108-0111); and (b) growing one or more non-polar (Al,B,In,Ga)N layers on the GaN layers (pg. 2/pp. 0016) to form at least one quantum well. It is noted that Dwilinski do not teach growing one or more non-polar (Al,B,In,Ga)N layers on the GaN layers forming at least one the quantum well ranging in width from approximately 20 A to approximately 70 A.

However, Alfano teach (e.g. fig. 2, see also pg. 2/pp. 0017 and pg. 3/pp. 0037, on polarization effects see pg. 4/pp. 0052 and claim 19) the method for forming a nitride semiconductor device, comprising: growing one or more non-polar (Al,B,In,Ga)N layers on the GaN layers forming at least one the quantum well ranging in width from approximately 20 A to approximately 70 A for the same benefit of improving the performance of state-of-the-art optoelectronic and electronic devices by making quantum structures not influenced by polarization-induced electric fields.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have the method for forming a nitride semiconductor device above, as disclosed by Dwilinski, comprising: growing one or more non-polar (Al,B,In,Ga)N layers on the GaN layers forming at least one the quantum well ranging in width from approximately 20 A to approximately 70 A as disclosed by Alfano for the same benefit of improving the performance of state-of-the-art optoelectronic and electronic devices by making quantum structures not influenced by polarization-induced electric fields.

Regarding claim 2, Alfano teach (e.g. fig. 2, see also pg. 2/pp. 0017 and pg. 3/pp. 0033, 0035, and 0037, on polarization effects see pg. 4/pp. 0052 and claim 19) the

method above, with a quantum well width of 40 A [Angstroms]. Alfano implicitly suggests modifying the quantum well width (amongst other properties) to within a range of desired energy levels (see fig. 2 for example on energy states having 40 Angstrom quantum well widths) to obtain the desired emission intensity.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to carry out the formation of the quantum well width at approximately 50 A [Angstroms] to obtain maximum emission intensity, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. In re Aller, 105 USPQ 233.

Regarding claim 3, Alfano teach (e.g. fig. 2, see also pg. 2/pp. 0017 and pg. 3/pp. 0033, 0035, and 0037, on polarization effects see pg. 4/pp. 0052 and claim 19) the method above, with a quantum well width of 40 A [Angstroms]. Alfano implicitly suggests modifying the quantum well width (amongst other properties) to within a range of desired energy levels (see fig. 2 for example on energy states having 40 Angstrom quantum well widths) to obtain the desired emission intensity.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to carry out the formation of the quantum well width at an optimal width of 52 A [Angstroms] to obtain optimum emission intensity, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. In re Aller, 105 USPQ 233.

Regarding claim 4, Dwilinski teach (pg. 1/pp. 7, pg. 2/pp. 18, and pgs. 6-7/pp. 0071) a resistive GaN and further teach the attenuation of this resistance. Applicant has claimed an inherent quality of the resistive nature of GaN layers of the nitride semiconductor device. Although the resistive nature is not explicitly stated, it is an inherent quality of the nitride semiconductor device to prevent band edge emission at room temperature, resulting in emissions only from the quantum well. Furthermore, Alfano teach (e.g. fig. 2, see also pg. 2/pp. 0017 and pg. 3/pp. 0033, 0035, and 0037, on polarization effects see pg. 4/pp. 0052 and claim 19) teach GaN layers to form a MQW structure with desired emissions (as noted above).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have the method above, wherein a resistive nature of the GaN layers prevents band edge emission at room temperature, resulting in emissions only from the quantum well, an inherent nature of the structure, as disclosed by Dwilinski and Alfano for the same benefit of improving the performance of state-of-the-art optoelectronic and electronic devices by making quantum structures not influenced by polarization-induced electric fields.

Regarding claim 5, Dwilinski teach (pg. 2/pps. 0015-0017, GaN planes: pg. 10/pp. 0109, substrate planes: claim 3) the method above, wherein the GaN layers are non-polar a-plane GaN layers and the substrate is an r-plane substrate for the same benefit of improving the performance of state-of-the-art optoelectronic and electronic devices by making quantum structures not influenced by polarization-induced electric fields.

Regarding claim 6, Dwilinski suggest (pg. 1/pps. 0002-0003) but do not explicitly teach the method above, wherein the substrate is a sapphire substrate.

However, Alfano teach (e.g. fig. 1, see also pg. 3/pp. 0031) the method above, wherein the substrate is a sapphire substrate for the same benefit of improving the performance of state-of-the-art optoelectronic and electronic devices by making quantum structures not influenced by polarization-induced electric fields.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have the method above as disclosed by Dwilinski, wherein the substrate is a sapphire substrate as disclosed by Alfano for the same benefit of improving the performance of state-of-the-art optoelectronic and electronic devices by making quantum structures not influenced by polarization-induced electric fields.

Regarding claim 7, Dwilinski teach (pg. 7/pps. 0081-0084) the method above, wherein the growing step (a) comprises: (1) annealing the substrate; (2) depositing a nitride-based nucleation layer (pgs. 6-7/pp. 0071) on the substrate (Applicant admits that nucleation layers and uses precursors such as trimethylgallium and ammonia are commonly used in the growth of c-plane nitride semiconductors on pg. 2/pps. 0027-0028); (3) growing the GaN layer on the nucleation layer; and (4) cooling the GaN under a nitrogen overpressure (pg. 7/pp. 0081 wafer is processed in MOCVD device under nitrogen atmosphere from annealing to cooling process) for the same benefit of improving the performance of state-of-the-art optoelectronic and electronic devices by making quantum structures not influenced by polarization-induced electric fields.

Regarding claim 8, Dwilinski teach (e.g. using MOVCD in Example 1, pg. 7/pp. 0092 to pg. 8/pps. 0093-0101) the method above, wherein the growing steps are performed by a method selected from a group comprising metalorganic chemical vapor deposition (MOCVD), molecular beam epitaxy (MBE), liquid phase epitaxy (LPE), hydride vapor phase epitaxy (HVPE), sublimation, and plasma-enhanced chemical vapor deposition (PECVD) for the same benefit of improving the performance of state-of-the-art optoelectronic and electronic devices by making quantum structures not influenced by polarization-induced electric fields.

Regarding claim 9, Dwilinski teach a device manufactured using the method of above (e.g. Example 1, pgs. 6-7, in Example 1 a nitride semiconductor laser device is manufactured pg. 7/pp. 0089) for the same benefit of improving the performance of state-of-the-art optoelectronic and electronic devices by making quantum structures not influenced by polarization-induced electric fields.

Regarding claim 10, Dwilinski teach the process of creating a nitride semiconductor device, comprising: (a) growing one or more gallium nitride (GaN) layers on a substrate (claim 10, pg. 5/pp. 0059, pg. 10/pps. 0108-0111); and (b) growing one or more non-polar (Al,B,In,Ga)N layers on the GaN layers (col. 3/lls. 10-16) to form at least one quantum well. It is noted that Dwilinski do not teach growing one or more non-polar (Al,B,In,Ga)N layers on the GaN layers forming at least one the quantum well ranging in width from approximately 20 A to approximately 70 A.

However, Alfano teach (e.g. fig. 2, see also pg. 2/pp. 0017 and pg. 3/pp. 0037, on polarization effects see pg. 4/pp. 0052 and claim 19) the process of creating a nitride

semiconductor device, comprising: growing one or more non-polar (Al,B,In,Ga)N layers on the GaN layers forming at least one the quantum well ranging in width from approximately 20 A to approximately 70 A for the same benefit of improving the performance of state-of-the-art optoelectronic and electronic devices by making quantum structures not influenced by polarization-induced electric fields.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have the process of creating a nitride semiconductor device above, as disclosed by Dwilinski, comprising: growing one or more non-polar (Al,B,In,Ga)N layers on the GaN layers forming at least one the quantum well ranging in width from approximately 20 A to approximately 70 A as disclosed by Alfano for the same benefit of improving the performance of state-of-the-art optoelectronic and electronic devices by making quantum structures not influenced by polarization-induced electric fields.

Regarding claim 11, Dwilinski teach a nitride semiconductor device, comprising: (a) one or more gallium nitride (GaN) layers grown on a substrate (claim 10, pg. 5/pp. 0059, pg. 10/pps. 0108-0111); and (b) growing one or more quantum wells formed from one or more non-polar (Al,B,In,Ga)N layers grown on the GaN layers (col. 3/lls. 10-16). It is noted that Dwilinski do not teach the quantum well having ranging in width from approximately 20 A to approximately 70 A.

However, Alfano teach (e.g. fig. 2, see also pg. 2/pp. 0017 and pg. 3/pp. 0037, on polarization effects see pg. 4/pp. 0052 and claim 19) the nitride semiconductor device, comprising: one or more quantum wells formed from one or more non-polar

(Al,B,In,Ga)N layers, wherein the quantum well has a width ranging from approximately 20 A to approximately 70 A for the same benefit of improving the performance of state-of-the-art optoelectronic and electronic devices by making quantum structures not influenced by polarization-induced electric fields.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to make the nitride semiconductor device above, as disclosed by Dwilinski, comprising: one or more quantum wells formed from one or more non-polar (Al,B,In,Ga)N layers, wherein the quantum well has a width ranging from approximately 20 A to approximately 70 A as disclosed by Alfano for the same benefit of improving the performance of state-of-the-art optoelectronic and electronic devices by making quantum structures not influenced by polarization-induced electric fields.

Conclusion

3. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Vaudo et al. (US 6,156,581), Takeuchi et al. (US 6,229,151), Tanaka et al. (US 6,298,079), Takeuchi et al. (US 6,569,704), Kadota, Michio (US 6,590,336), Krames et al. (US 6,849,472), Majumdar et al. (US 6,882,051), Xu et al. (US 6,951,695), Majumdar et al. (US 6,996,147), Dwilinski et al. (US 7,057,211), Dwilinski et al. (US 7,132,730), Akkipeddi et al. (US 7,208,096) show methods and devices similar to the instant invention.

4. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Arman Khosraviani whose telephone number is 571-272-2554. The examiner can normally be reached on Monday to Friday, 7:30a - 5:00p (Eastern Time).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Angela Ortiz can be reached on 571-272-1206. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Arman Khos.

AK

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SUPERVISORY PATENT EXAMINER
8/9/07